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## Projection Display Technology

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### SIDEBAR: A New Field-Sequential Color Approach

In June 2001 at the Society for Information Display (SID) meeting in San Jose, Philips Components unveiled a new LCOS chip designed for projection applications. Even more interesting than the chip itself was the reference design the company created to demonstrate a single-chip LCOS reflective-LCD projector using field-sequential color illumination (instead of three LCOS panels as in most LCOS designs, as noted in our main story).

Instead of using a color wheel, the projector uses beam splitters to separate the light from the lamp into red, green, and blue beams. These are then directed at rectangular prisms that are spinning on their long axes.

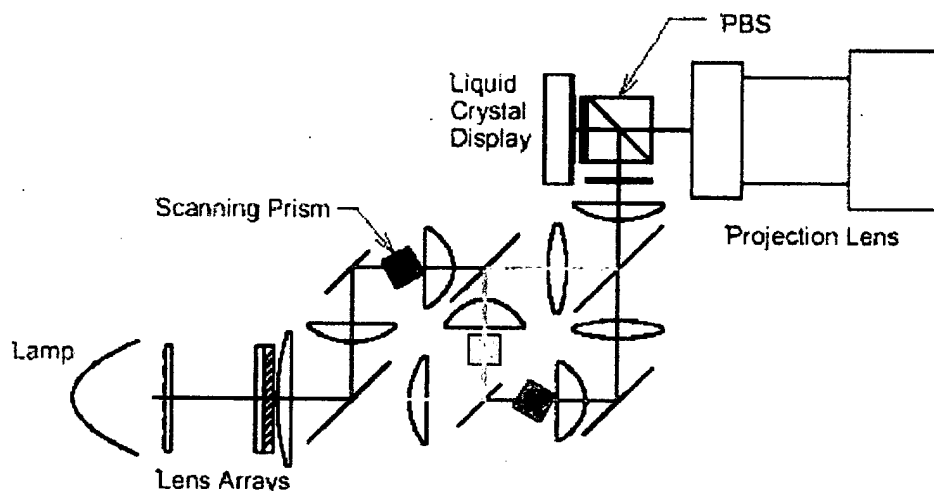


Figure is from "Single panel reflective LCD projector", Jeffrey A. Shimizu, Philips Research

The light from these three prisms is then focused on a polarizing beam splitter that directs the light at the single LCOS chip, where it is then reflected back through the splitter and into the projection lens.

The key to this system is that each light beam only illuminates one third of the panel at a time. In a system Philips calls "scrolling color", the bands of colored light moves

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rapidly across the face of the panel, which adjusts to display the correct image for that color as the light passes over it. As soon as one color band starts to "fall off" the end of the panel, the rotation of the prism causes it to reappear at the other edge of the panel.

This may sound like a particularly complex design, but according to Philips engineers, it is a surprisingly forgiving design to assemble and adjust. They used a hard disk drive motor running at one-tenth its design speed, and only one-tenth the operating load, yet it produces 180 Hz color fields, which projects each color three times per 60 Hz frame. Alignment of the light beams need not be nearly as precise as in three-panel designs, which also lowers assembly costs.

The big advantage, however, is in light efficiency. A DLP projector's color wheel creates the color by filtering the light. This means that two-thirds of the light is lost when projecting each color. Even the addition of a fourth, clear segment still means that two-thirds of the light is lost for three-fourths of the time. In contrast, the full light beam is split into three parts in the Philips design, and then each of these beams is concentrated on one-third of the panel. In other words, all the light reaches the panel. As a result, a projector with the Philips scrolling color should be as much as twice as bright as color wheel designs with the same lamp and panel.





Philips does not plan to produce this projector imaging engine, but instead created it as a reference design to be used by customers for its LCOS display panel. At present, no projectors using this design have been announced, but it will be interesting to see how they perform when they do come to market.

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